

**NHANES 1999–2000 Data Documentation**  
**Revised September 2006**  
**Lab 13AM – Triglycerides and LDL-Cholesterol**

**Description**

The goals of this component are: 1) to monitor the prevalence and trends in major cardiovascular conditions and risk factors in the U.S.; and 2) to evaluate prevention and treatment programs targeting cardiovascular disease in the U.S.

The main element of the cardiovascular disease laboratory component in NHANES is blood lipid levels. Cardiovascular disease is the leading cause of death in the United States. The data will be used to monitor the status of hyperlipidemia and the success of the National Cholesterol Education Program.

**Eligible Sample and Component-Specific Exclusions:**

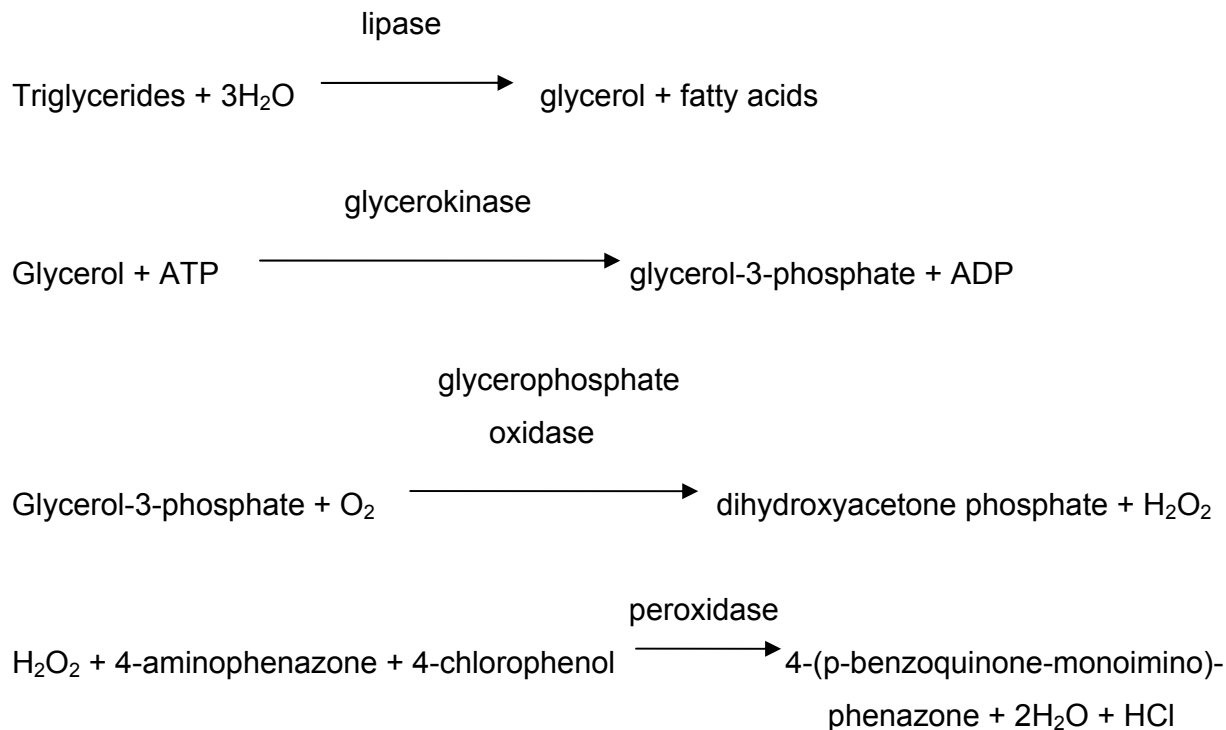
Data for participants aged 3 years and older who do not meet any of the exclusion criteria were sampled. Fasting weights are available for sample persons 12 years and older who fasted at least 8 hours or more but less than 24 hours. Morning weights are available for participant's ages 3-11 years.

**Examination Protocol**

Detailed specimen collection and processing instructions are discussed in the NHANES Laboratory/Medical Technologists Procedures Manual (LPM). Vials were stored under appropriate frozen (–20°C) conditions until they were shipped to the Johns Hopkins University Lipoprotein Analytical Lab for testing.

**Analytic Methodology**

Triglycerides are measured enzymatically in serum or plasma using a series of coupled reactions in which triglycerides are hydrolyzed to produce glycerol. Glycerol is then oxidized using glycerol oxidase, and  $H_2O_2$ , one of the reaction products, is converted via peroxidase to a phenazone. Absorbance is measured at 500 nm. The reaction sequence is as follows:



High levels of serum triglycerides help determine the risk for coronary heart disease (CHD) and peripheral atherosclerosis. High triglycerides are associated with increased risk for coronary artery disease (CAD) in patients with other risk factors, such as low HDL-cholesterol, some patient groups with elevated apolipoprotein-B, and patients with forms of low-density lipoprotein (LDL)-cholesterol that may be particularly atherogenic. Desirable fasting triglyceride levels are considered to be those below 150 mg/dL and are further categorized as borderline high, 150–199 mg/dL; high, 200–499 mg/dL; and very high, greater than or equal to 500 mg/dL. Very high triglycerides can result in pancreatitis. Triglycerides are also measured because the value is used to calculate LDL-cholesterol concentrations. In NHANES, triglycerides are only measured in participants examined in the morning session.

#### LDL-Cholesterol

Most of the circulating cholesterol is found in three major lipoprotein fractions: Very low-density lipoproteins (VLDL), LDL, and HDL. LDL-cholesterol is calculated from measured

values of total cholesterol, triglycerides, and HDL-cholesterol according to the Friedewald calculation:

$$[\text{LDL-cholesterol}] = [\text{total cholesterol}] - [\text{HDL-cholesterol}] - [\text{triglycerides}/5]$$

where  $[\text{triglycerides}/5]$  is an estimate of VLDL-cholesterol and all values are expressed in mg/dL. The calculation is valid only for triglycerides less than or equal to 400 mg/dL.

LDL carries most of the circulating cholesterol and, when elevated, contributes to the development of coronary atherosclerosis. LDL-cholesterol is measured to assess risk for CHD and to follow the progress of patients being treated to lower LDL-cholesterol concentrations. Desirable levels of LDL-cholesterol are below 130 mg/dL, borderline high is from 130–159 mg/dL, high is 160–189 mg/dL and very high LDL-cholesterol is greater than or equal to 190 mg/dL. LDL-cholesterol is reported only for participants ages 12 and above who fasted at least 8 hours or more but less than 24 hours and who were examined in the morning examination session.

## Analytic Notes

### LBXTR

Serum triglyceride levels were measured on NHANES examinees who were examined in the morning session only. Eligible NHANES examinees were randomly assigned to the morning fasting sample.

The Laboratory 13AM data file contains laboratory test results for triglycerides (LBXTR), which uses the reference analytic method. However, the NHANES Laboratory 18 biochemistry profiles also include measurements of triglycerides (Laboratory 18 variable name: LBXSTR). The appropriate triglyceride variable to use is LBXTR from Lab 13AM.

### LBDTRSI

The triglycerides in mg/dL (LBXTR) were converted to mmol/L (LBDTRSI) by multiplying by 0.01129.

## LBDLDL

Serum LDL-cholesterol levels were measured on examinees who were examined in the morning session. The distribution of serum LDL-cholesterol should be estimated on examinees ages 12 and above who fasted at least 8 hours or more but less than 24 hours. LDL-cholesterol is calculated from measured values of total cholesterol, triglycerides, and HDL-cholesterol according to the Friedewald calculation:

$$[\text{LDL-cholesterol}] = [\text{total cholesterol}] - [\text{HDL-cholesterol}] - [\text{triglycerides}/5]$$

where all values are expressed in mg/dL. The calculation is valid for triglycerides only less than or equal to 400 mg/dL.

## LBDLDLSI

The LDL-cholesterol in mg/dL (LBDLDL) was converted to mmol/L (LBDLDLSI) by multiplying by 0.02586.

## SAMPLING WEIGHTS

WTSAF4YR and WTSAF2YR (4-year and 2-year fasting weights for participants 12+ years and morning weights for 3-11 years):

Participants were assigned to MEC in the morning, afternoon or evening sessions. One-half of the participants were assigned to the morning session. Participants examined in the morning session ages 12 years and above were requested to fast at least 8.5 hours prior to phlebotomy and participants ages 3-11 years were not required to fast.

For participants 12 years and older, subsample weights were generated to account for different response rates between the morning MEC session and the afternoon/evening MEC sessions. Subsample weights were generated from participants in the morning session because of nonresponse due to non-fasting and phlebotomy refusals. Thus, these weights are referred to as “fasting” weights. Fasting weights were generated for the diabetes laboratory testing (Laboratory 10AM) and were also used for triglycerides and LDL cholesterol (Laboratory 13AM) because multiple sets of fasting weights were not desirable. Non-zero fasting weights were generated for sample persons 12 years and older, who

fasted 8.5 up to 24 hours and were examined in the morning session. In addition, these sample persons were never told by a healthcare provider that they had diabetes (DIQ010 ≠ 1) and had non-missing glucose values or the healthcare provider said they had diabetes (DIQ010 = 1). The analyst is strongly encouraged to use the 4-year weights (WTSAF4YR) to analyze 1999-2002 triglycerides and LDL-cholesterol for participants 12 years and older. The 2-year weights (WTSAF2YR) should be used when analyzing NHANES 1999-2000. The use of the full sample MEC examined weights (WTMEC4YR or WTMEC2YR) should not be used to analyze the data.

Subsample weights are also provided for participants aged 3–11 years. The analyst should use these weights for 3-11 years with great caution. Many of these participants were not fasting and these weights were not adjusted for nonresponse in this age group. Weights (WTSAF4YR or WTSAF2YR) for ages 3-11 are referred to as “morning” weights because they were not adjusted for nonresponse or non-fasting. The analyst may wish to consider the issue of re-weighting the data for 3-11 years. Therefore, when considering the analysis of data for ages 3 and over, the analyst should analyze the data with great caution because of the different weighting methodology and fasting protocols for the participants between ages 3-11 and ages 12 and over.

See the Analytic Guidelines regarding applying weights for analysis of data.

**Please Note:**

The morning fasting sample weights (WTSAM2YR) and the jackknife replicate morning fasting sample weights (WTSAM01-WTSAM52) for triglycerides and LDL-cholesterol were withdrawn in January 2005.

### **Special Notes about this Dataset**

The analysis of NHANES 1999–2000 laboratory data must be conducted with the key survey design and basic demographic variables. The NHANES 1999–2000 Household Questionnaire data files contain demographic data, health indicators, and other related information collected during the household components. The Household Questionnaire data

files include all of the survey design variables and sample weights required to analyze these data. The Phlebotomy Examination file includes auxiliary information on duration of fasting, the time of day of the venipuncture, and the conditions precluding venipuncture. The Household Questionnaire and Phlebotomy Exam files may be linked to the laboratory data file using the unique survey participant identifier SEQN.

## **References**

N/A